

§ 23.415 Ground gust conditions.

(a) The control system must be investigated as follows for control surface loads due to ground gusts and taxiing downwind:

(1) If an investigation of the control system for ground gust loads is not required by paragraph (a)(2) of this section, but the applicant elects to design a part of the control system of these loads, these loads need only be carried from control surface horns through the nearest stops or gust locks and their supporting structures.

(2) If pilot forces less than the minimums specified in § 23.397(b) are used for design, the effects of surface loads due to ground gusts and taxiing downwind must be investigated for the entire control system according to the formula:

$$H = K c S q$$

where—

H=limit hinge moment (ft.-lbs.);

c=mean chord of the control surface aft of the hinge line (ft.);

S=area of control surface aft of the hinge line (sq. ft.);

q=dynamic pressure (p.s.f.) based on a design speed not less than $14.6 \sqrt{(W/S) + 14.6}$ (f.p.s.) where W/S=wing loading at design maximum weight, except that the design speed need not exceed 88 (f.p.s.);

K=limit hinge moment factor for ground gusts derived in paragraph (b) of this section. (For ailerons and elevators, a positive value of K indicates a moment tending to depress the surface and a negative value of K indicates a moment tending to raise the surface).

(b) The limit hinge moment factor *K* for ground gusts must be derived as follows:

Surface	<i>K</i>	Position of controls
(a) Aileron	0.75	Control column locked lashed in mid-position.
(b) Aileron	±0.50	Ailerons at full throw; + moment on one aileron, – moment on the other.
(c) Elevator	±0.75	(c) Elevator full up (–).
(d) Elevator	(d) Elevator full down (+).
(e) Rudder	±0.75	(e) Rudder in neutral.
(f) Rudder	(f) Rudder at full throw.

(c) At all weights between the empty weight and the maximum weight declared for tie-down stated in the appropriate manual, any declared tie-down points and surrounding structure, control system, surfaces and associated

gust locks, must be designed to withstand the limit load conditions that exist when the airplane is tied down and that result from wind speeds of up to 65 knots horizontally from any direction.

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HORIZONTAL STABILIZING AND BALANCING SURFACES

§ 23.421 Balancing loads.

(a) A horizontal surface balancing load is a load necessary to maintain equilibrium in any specified flight condition with no pitching acceleration.

(b) Horizontal balancing surfaces must be designed for the balancing loads occurring at any point on the limit maneuvering envelope and in the flap conditions specified in § 23.345.

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§ 23.423 Maneuvering loads.

Each horizontal surface and its supporting structure, and the main wing of a canard or tandem wing configuration, if that surface has pitch control, must be designed for the maneuvering loads imposed by the following conditions:

(a) A sudden movement of the pitching control, at the speed V_A , to the maximum aft movement, and the maximum forward movement, as limited by the control stops, or pilot effort, whichever is critical.

(b) A sudden aft movement of the pitching control at speeds above V_A , followed by a forward movement of the pitching control resulting in the following combinations of normal and angular acceleration:

Condition	Normal acceleration (n)	Angular acceleration (radian/sec.)
Nose-up pitching	1.0	$+39n_m + V \times (n_m - 1.5)$
Nose-down pitching	n_m	$-39n_m + V \times (n_m - 1.5)$

where—

(1) n_m =positive limit maneuvering load factor used in the design of the airplane; and

(2) V =initial speed in knots.